

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2021-592

Anonymous Referee #2

Referee comment on "Declines and peaks in NO₂ pollution during the multiple waves of the COVID-19 pandemic in the New York metropolitan area" by Maria Tzortziou et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-592-RC1>, 2021

The authors focus on the declines and peaks in NO₂ pollution during the multiple lockdown phases in the New York metropolitan area and disentangle the contribution of anthropogenic emissions sources and role of meteorology. In general, I find this manuscript to be of interest for publication and appropriate for Atmospheric Chemistry and Physics. I have one main concern and several minor suggestions for improvement listed below that should be considered by the authors before publication.

The authors use total column NO₂ in this study and a few references are made to tropospheric column NO₂ throughout the manuscript. The authors can be specific about whether the "column NO₂" refers to "total column NO₂" or "tropospheric column NO₂". I have pointed out a few instances below. Typically, studies use tropospheric column NO₂ to relate to changes in NO_x emissions. How do the values of total column NO₂ compare to tropospheric column NO₂ for New York metropolitan area? The authors should consider discussing why total column NO₂ is used and the possible impacts on the results.

Minor comments

Line 68 Population and area of New York metropolitan area?

Line 81-86 Do both these studies use total column NO₂? Or tropospheric column NO₂?

Line 85 "0.4° radius". Also mention in kms to compare to 100km radius in previous sentence.

Line 101 "4% yr⁻¹ decrease ..." is in tropospheric column NO₂. How would the trend values be for total column NO₂?

Line 106 "...highest national NO₂ levels." The authors can give value of annual mean NO₂ and compare to the recently updated WHO guidelines.

Line 117 Here and everywhere else, the authors mention high-frequency observations from Pandora but do not provide any value.

Line 131 Section heading can be changed to "Materials and Methods" as the subheadings also focus on the various datasets.

Line 135 Last assessed date for the URL.

Line 169 Tropospheric columns of?

Line 173 Filtering criteria such as $TCNO_2 > 0$ can lead to a positive bias in the mean $TCNO_2$. Is it possible to quantify how much data is removed because of this filtering criteria and if the positive bias is large?

Line 187 The authors use total column NO₂, but the retrieval steps are also given for tropospheric vertical column.

Line 189-190 Would the version change have a significant impact on the results?

Line 193 Here again, the authors mention about validation of "tropospheric columns".

Line 253 "(v) in March-April 2021" should be "March-May 2021", right?

Line 266 URL or DOI for MTA data?

Line 297 "Variability in TCNO2 also decreased..." except New Brunswick?

Line 320 "Fig.5, right panel." "Middle and right panels" perhaps?

Line 324-326 This statement starts suddenly and the value for NO2 changes need to be given before explaining why they are lower compared to NOx changes.

Line 339-344 The authors can consider giving a brief description of how these changes in NOx emissions were obtained (either here or in section 2).

Lines 484-492 Interesting result!

Table 1 The table caption can include details of the time. "Present" may be replaced by "05/2021" Additional footnotes can be used on the column of "Temporal range of data" to mention data unavailability. For example, data from PSI#135 not available for Jan-Mar 2020 is mentioned in Figure 4 and should also be mentioned in table 1. The value of stdev

for PSI#56,#69 for Sept-Nov reads as "0.24x". Check for typo. Lastly, are both the PSIs at Queens, New Brunswick and New Haven in operation for the time period stated and is the data from both of them used?

Figure 1 Is there a way the different major pollutant emitters can be identified on the map? For example, by use of numbers with the circles and the numbers can be stated in the figure caption. This would aid the interpretation of the results on lines 419-424.

Figure 2 What is the "ratio difference"? It is not clear in the figure caption also.

Figure 7 The colors for TROPOMI and Pandora bars in (a) are different from the ones in the key. In panel (b), please add the year next to the months and consider adding error bars.

Figure 8 The caption can be slightly modified to reflect that TROPOMI observations are only over Manhattan.

Figure 9 The authors can consider labeling the panels and refer to the individual panel in the text.

Figure 12 The time and location are missing in the figure caption.